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FOUNDRY TRADE JOURNAL
Established 1902
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Vol. 69 Thursday, January 21, 1943 No. 1379

Moulding Materials Developments

The Second Report of the Moulding Materials Sub-Committee is a document of fundamental importance to the whole of the foundry industry. It has been issued through the Iron and Steel Institute on behalf of that body and the British Iron and Steel Federation. *Inter alia* it reveals details of the success achieved in finding a substitute for bentonite, which has to be imported from America. This substitute is based on fuller's earth, and not only are physical requirements of the actual mould fulfilled, but also it is being used as a suspensory agent in silica paint instead of bentonite. Other work has been carried on moulding sand for the steel foundry by using mixtures of selected sandstones and clays. With proper technique these can be quite serviceable. Another development disclosed is the use of a synthetic resinous material which can replace linseed oil and corn starch products. Because these enter into category of food, their conservation is at the moment vital, so much so that Germany has entirely prohibited their use in foundry practice. A hint is given that high permeability in cores is perhaps not so important as has been universally assumed by foundry technicians. Another commendable investigation detailed in the Report is the examination of a number of additional sources of supply of naturally-bonded moulding sands, as their local use reduces the pressure on the national transport service. Sands, which prior to the war were imported, have, in most cases, been satisfactorily replaced by domestic sources of supply. Conservation of sand leads directly to the conservation of metal, and a useful hint is given for the confection of some types of feeder head so as to reduce heat losses by lowering the thermal conductivity of the sand used. The best mixture carries heavy saw dust additions, and here at least is a material of which there is an abundant supply. The fare provided is excellent, yet promise is made of further good things to come, for investigations on the hot strength of moulding sands are in progress.

This is a subject which is also being followed up by the research workers acting under the direction of the American Foundrymen's Association. In this case, much preliminary work had to be done to find a standard test-piece of acceptable size. However, the work, despite setbacks due to war conditions, is now making commendable progress. This search for suitable apparatus and standards has, as we anticipated, caused a few headaches on this side of the Atlantic also. The Report discloses dissatisfaction with the results given by the B.C.I.R.A. permeability apparatus, and a modified machine has been devised. Yet we do not believe finality has been achieved. If, however, the modified apparatus is capable of permitting reproducible results to be obtained by operators working in widely separated foundry laboratories, then indeed a great service will have been done to the foundry industry throughout the world. We stress this, as in places like Australia and South Africa, where sand testing is nothing like so highly developed as in America and Great Britain, progress is being retarded, as a feeling is prevalent that, whilst the tools available are useful, they cannot be regarded as being of the sort which would make the results they obtain comparable with those they read about, in what is to them overseas technical literature. Even this Report under review has had to issue a warning as to the "desirability"—we would have preferred to use the word necessity—of periodically calibrating the pressure gauges on the hydraulic machines used for the ascertainment of the dry strength of sands. The Sub-Committee well merits the thanks of the industry, not only in this country, but wherever the founding of metals is practised.

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COREMAKING PRACTICE

A Paper read before the Institute of Australian Foundrymen was deemed to be so useful by the Council for Scientific and Industrial Research of the Commonwealth of Australia that it has been reissued by the Department as Industrial Chemistry Circular No. 1. Much, however, is not new to our readers, whilst a certain amount is of Dominion interest only. Nevertheless, it is a highly important contribution to the literature on the subject of coremaking, and below several abstracts have been made of sections containing new material.

Yacca Resin and Core Drying

A resin is obtainable from the Australian grass tree, which is known as acaroid or yacca resin. One foundry in Melbourne has carried out some experiments with this resin; it reports very satisfactory cores for use where high contraction is encountered. In the Foundry Sands Laboratory of the Council for Scientific and Industrial Research, the author has also carried out some dry compression strength tests on cores made from free sand bonded with this yacca resin, with the following results:—

Binder.	Moisture.	Green compression strength.	Dry compression strength.*
Per cent.	Per cent.	Lb. per sq. in.	Lb. per sq. in.
2	2.0	1.0	224
5	3.8	2.1	over 270

* Cores baked for 2 hours at 175 deg. C.

Dealing with the baking of linseed-oil cores, the author points out that the amount of air to oxidise the oil is small compared with that needed to drive off the moisture, and that, if sufficient air is provided for efficient drying, there will be plenty for baking.

Fuels for Coredrying

The advantages and disadvantages of the various fuels are as follow:—

(1) Coal is not very satisfactory on account of the difficulty of controlling the temperature in the oven. As it burns at a high temperature, provision must be made for lowering the temperature of the products of combustion as they enter the oven.

(2) Coke is the cheapest of the fuels, but suffers from the disadvantages that it is not flexible and it is difficult to control the temperature and atmosphere in the oven. In addition, labour is needed for handling fuel and ash. However, direct-fired air heaters have been successfully adapted to burn coke.

(3) Fuel oil is very satisfactory, especially if used with a direct-fired air heater. As with coal, the flame temperature is high, and it is necessary to dilute the products of combustion. One disadvantage is that space must be provided for the storage of oil. Maintenance of oil burners may be higher than for other types.

(4) Gas is extremely clean and flexible and the temperature of the oven may be controlled very easily. The equipment is simple in design and there is little maintenance. A rough estimate of the consumption rate is 1 cub. ft. per lb. of cores.

(5) Electricity is also clean and extremely flexible. It allows easy control of temperature and reduces fire risk. However, it is recognised that electricity cannot compete with other fuels in the baking of large cores. Consumption figures given vary from 0.1 to 0.5 kw.-hrs. per lb. of cores.

It should be realised that a considerable amount of energy is used in heating core carriers and plates. The size of driers should therefore be cut down to a minimum. The use of aluminium plates of the same size, instead of iron, will reduce the total weight and the amount of heat needed.

CORRESPONDENCE

[*We accept no responsibility for the statements made or the opinions expressed by our correspondents.*]

To the Editor of THE FOUNDRY TRADE JOURNAL.

Fuel Conservation in Foundries

SIR,—Mr. McRae Smith, in commenting on Mr. Brown's reference to leakage of compressed air in foundries, made the very significant remark, *viz.*, "Probably more air was lost in that way, and consequently more fuel was wasted in producing power for compressing the air, than was used legitimately."

If foundry executives generally would remember this remark, and also the fact that the flow of air through a ¼-in. dia. orifice at 100-lbs. pressure would dissipate approximately 103 cub. ft. of free air per min., and that it would require in a two-stage compressor about 14 h.p. to maintain such a leakage. I feel sure a substantial fuel economy would result.

Yours, etc.,
ANDERTON WARDLE.

Wilton House,
Mellor, nr. Stockport.

NOTES FROM THE BRANCHES

London Branch.—The 1943 session will open at the National Liberal Club, Whitehall Place, S.W.1, on January 23, at 2.30 p.m., when Mr. W. Gladwell, of Mallory Metallurgical Products, will read a Paper on "Radiography as an Aid to Foundry Technique." A series of lantern slides will illustrate the lecture.

The production of metallic magnesium is being actively developed in Japan. The leading manufacturers are the Kashiwazaki works of the Rikagaku Kogyo Kaisha, the Ube works of the Riken Metal Company, the Ogu works of the Asahi Electrical Chemical Industry Company, the Shibukawa works of the Kanto Electric Industries Company, and the Naoetsu works of the Shinestu Chemical Industry Company.

MOULDING SANDS AND MATERIALS

SECOND REPORT OF THE MOULDING MATERIALS SUB-COMMITTEE OF THE STEEL CASTINGS RESEARCH COMMITTEE*

Section I.—Introduction and Summary. Section II, Part I.—Examination of Moulding Sands

SECTION I.—INTRODUCTION AND SUMMARY

Since the publication of the First Report of the Moulding Materials Sub-Committee[1] an important part of their work has been the investigation of possible alternatives to bentonite for the bonding and revivifying of moulding and core sands. The fundamental investigation of the characteristics of bond clays and of the mechanism of bonding which is in progress has already confirmed the superior bonding of clays of the montmorillonite type. Apart from the fuller's earths the only clays occurring in Great Britain so far found to be rich in minerals of the montmorillonite group are those occurring in the London Clay measures, but they also contain a high proportion of siliceous silt which lowers their bonding power. The bond strength, the ratio of dry strength to green strength and the range of retention of green strength with increasing moisture content of clays, etc., containing montmorillonite clay substance has been shown to be almost directly as their montmorillonite content.

Experience with Fulbond

With the collaboration of The Fullers' Earth Union, Limited, selected and treated varieties of fuller's earth, occurring in Somerset and Surrey, to which the general designation of Fulbond has been given, and which have bonding characteristics close to those of normal bentonites, have been developed. Following exhaustive laboratory tests and practical trials, the attention of foundries was directed to this suitable alternative to bentonite; in most foundries a marked degree of success has attended its use, and bentonite has either been eliminated or its consumption very considerably reduced. A large tonnage of Fulbond is now being used in foundries and this usage is likely to continue even when bentonite is freely available again. To meet the needs of foundries requiring a bond with a rather greater moisture-holding capacity than Fulbond No. 1, Fulbond No. 3 has been developed, and this is also especially useful in foundries where the thorough milling which is desirable to develop the full bonding power of Fulbond No. 1 is not possible. Foundry experience has shown that the ramming, casting and stripping properties of the Fulbond mixtures are closely comparable to those of bentonite mixtures, and in reclamation plants the "life" of Fulbond is proving satisfactory. Fulbond can also be used satisfactorily as a suspensory agent in silica paint in place of bentonite. A number of other substitutes for bentonite have been investigated in the laboratory and the foundry, but none of them appears to be so generally useful as a selected variety of Fulbond.

A considerable number of clay bonds have been investigated fully, and the trials show that some of them when used in proportions of 5 to 10 per cent. with a high-silica sand give satisfactory green strength but are lower in dry strength than normal Fulbond or bentonite mixtures. The clay-bonded sands have a greater hot strength than the Fulbond or bentonite mixtures, and in some branches of foundry work this is a definite advantage. Laboratory investigations and foundry trials indicate a useful field for mixtures of a good bond clay with Fulbond, the Fulbond addition improving the plasticity and dry strength without markedly reducing the hot strength. When mixtures of clay and Fulbond are used it is necessary that the mixing shall be thorough. Where stocks of bentonite have been in existence attention has been directed to means of conserving them by the use of Fulbond-bentonite and bentonite-clay mixtures.

An investigation on the production of steel moulding sands by the thorough grinding and admixture of selected clays with selected sandstones is in progress. Some of the sandstones examined contain from 7 to 12 per cent. of partially weathered felspathic matter, and these have been shown to be a useful base for steel moulding sands; with the incorporation of 10 to 20 per cent. of clay the product has good general properties and can be diluted with silica sands to provide a range of strength and permeability. Special attention is being given to the weathered sandstones, such as those of the Wolsingham district of County Durham, which, because of their high content of "clay" from the decomposition of included felspathic minerals, give, when thoroughly broken down by wet-grinding, a moulding sand which is satisfactory in general steelfoundry use.

Experiments have been made with the addition of wetting agents to the water used in preparing moulding sands, but these additions do not appear to increase the rate of spread of the bond clay and have little effect on the strength of the moulding sand.

Reducing Edible and Other Materials in Cores

Investigations into the use of core binders have been made with particular reference to the possibility of effecting a reduction in the consumption of linseed oil and corn-starch products. It has been shown, for example, that in many cases up to one-half of the linseed oil in a core mixture can be replaced by Truline binder (a synthetic resinous material) without detriment to the strength and collapsability of the

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* A Joint Committee of The Iron and Steel Institute and The British Iron and Steel Federation, reporting to The Iron and Steel Industrial Research Council.

[1] Included in the Third Report of the Steel Castings Research Committee, The Iron and Steel Institute, 1938, Special Report No. 23, Section V., pp. 87-200.

core. Truline binder is particularly effective where reclaimed sands are used for core-making. Economies in the consumption of dextrin and other corn-starch products are of special importance, and attention is directed to the investigations which indicate the possibility of reducing the proportion of these materials in core mixtures by incorporating in the mixture a proportion of silica flour or a finely divided highly siliceous clay. One disadvantage of such mixtures is a reduction in permeability, but the trials which have been made indicate the possibility that undue importance has been attached to high permeability in cores. It has been shown in many instances that a reduction in the total quantity of core binders in a core sand does not result in any falling-off in performance.

As the quantity of sulphite lye available for use in foundries is decreasing, investigations have been made of possible alternatives which would have a similar behaviour in core mixtures. The use of "clay" binders in core mixtures has been examined, and the indications are that the incorporation of a proportion of a naturally bonded sand, a synthetic clay-bonded sand, bentonite, Fulbond or bond clay gives satisfactory results and renders possible an effective reduction in the proportion of organic binders. It must be borne in mind that highly colloidal bond clays, such as bentonite and Fulbond, tend to absorb an undue proportion of the organic bond, and that the proportion of clay bond must be limited so as to avoid poor collapsability of the cores after casting.

Owing to the necessity for increasing the production of silica sands and fine core sands, and to reduce the long-distance transport of sands, a large number of additional sources have been investigated fully. A number of these are now in use in foundries in the various steelmaking areas. These investigations are to be reported fully in a separate Paper, but it is gratifying to note here that imported sands have, in the main, been satisfactorily replaced by home resources.

To provide information needed by the Foundry Practice Sub-Committee, investigations of the thermal expansion of sand mixtures containing clay, and of mixtures of low thermal conductivity suitable for use in certain types of feeder head, have been made.

New Permeability Apparatus Developed

Special attention is directed to the desirability of the calibration of pressure gauges on hydraulic machines for the measurement of dry strength. In other work on the testing of sands a new simple type of permeability apparatus has been developed, which gives accurate results for sands of both high and low permeability; a full account of this apparatus is given.

An investigation on the hot strength of moulding sands is in progress, and it seems likely that its results will provide data of definite value to foundries, especially when considered in conjunction with high-temperature sintering tests. Methods for measuring the plasticity of moulding and core sands and the surface characteristics of sands are also the subject of investigation.

The Sub-Committee have been able to render service to numerous steel foundries where troubles have arisen in the supply or use of moulding or core sands, and they have collaborated with the British Cast Iron Research Association and the British Non-Ferrous Metals Research Association in matters of mutual interest. Much work has been done on behalf of the Foundry Bonding Materials Control of the Ministry of Supply.

Constitution of the Moulding Materials Sub-Committee

Since the First Report was published, certain changes in the personnel of the Sub-Committee have occurred, and the constitution now is as follows:—

* Dr. W. J. Rees, chairman, Sheffield University (also representing the British Cast Iron Research Association).
* Mr. T. R. Walker, secretary, English Steel Corporation, Limited (also representing the Institute of British Foundrymen).
Dr. C. H. Desch, F.R.S., the Iron and Steel Industrial Research Council.
Mr. G. T. Hampton, F. H. Lloyd & Company, Limited.
Mr. J. E. Mercer, Head, Wrightson & Company, Limited (also representing the General Steel Castings Association).
* Mr. D. A. Oliver, Wm. Jessop & Sons, Limited.
* Dr. R. J. Sarjant, Hadfields, Limited.
Mr. J. J. Sheehan, Coneygre Foundry, Limited.
Mr. A. Wheeler, Edgar Allen & Company, Limited.

Those members against whose names an asterisk is placed are members of the Technical Advisory Committee of the Foundry Bonding Materials Control.

Mr. R. H. S. Robertson, of the Fullers' Earth Union, Limited; Mr. W. B. Parkes, of the British Cast Iron Research Association; and Mr. J. Lumsden, of the Foundry Bonding Materials Control, have attended numerous meetings of the Sub-Committee by invitation, for purposes of liaison.

SECTION II—MOULDING SANDS

Part I—Examination of Moulding Sands

One of the objects of the Sub-Committee from its inception was to continue Boswell's examination of possible British alternatives to Belgian and French moulding sands. A number of moulding sands of domestic origin were investigated before the war began, and the results were published in the First Report of the Sub-Committee.[1] Since then the work has been carried on continuously. Several additional deposits have been developed; others have been surveyed and representative samples of sand obtained for them. Observations on the deposits and the results of testing sand samples are given below.

Moulding Sand from the Raynham Estate, Fakenham, Norfolk

The deposit of this sand is said to be of considerable extent, and the sample examined was representative of

[1] Third Report of the Steel Castings Research Committee, Section V., p. 87, Iron and Steel Institute, 1938, Special Report No. 23.

Moulding Sands and Materials

the bulk which could be supplied for use. The sample as received contained a large number of agglomerated lumps; these were all crushed, and the whole of the bulk sample was then thoroughly mixed before quartering to obtain the sample for the tests.

Chemical Analysis.—Chemical analysis on a sample dried at 105 deg. C. gave the following results:—Silica, 85.65 per cent.; alumina, 6.04; iron oxide, 3.28; titanium oxide, 0.38; lime, 0.95; magnesia, 0.14; alkalis (as K_2O), 0.82, and loss on ignition, 2.65 per cent.; total, 99.91 per cent.

Refractoriness.—By comparison with standard cones, the refractoriness was equivalent to that of cone 27 (1,610 deg. C.).

Mechanical Analysis.—The following is the sieve analysis of the material:

B.S.I. Sieves.		
On 10 mesh	Nil.	
„ 16 „	0.2	per cent.
„ 22 „	0.4	„
„ 30 „	0.4	„
„ 44 „	1.3	„
„ 60 „	4.4	„
„ 72 „	6.7	„
„ 100 „	19.0	„
Thro' 100 „	67.6	„
	100.0	„

Compression Strength.—The compression strength of green-sand test-pieces was found to be as follows:

Water added to dry sand, per cent.	1	2	3	4	5	6	7	8	9
Compression, green strength. Lb. per sq. in.	0	2.2	5.4	7.3	9.2	7.3	6.7	6.5	6.0

The optimum green strength was obtained, as shown above, with a moisture content of 5 per cent.

Dry Compression Strength.—The compression strength of test-pieces made with a 5 per cent. moisture content, dried at 200 deg. C., was 105 lbs. per sq. in.

Permeability.—The permeability number of green-sand test-pieces with a 5 per cent. moisture content for optimum green strength was 18. As shown by the mechanical analysis, this sand is of fine grain size, and in consequence its permeability is rather low. It would probably be satisfactory for use in iron foundries, but actual foundry trials would be necessary to determine its suitability for general purposes.

Bonding Properties.—The refractoriness and strength of the sand are high enough to permit of its use in steel casting, but the permeability is too low. Tests were therefore made of mixtures of the sand with Arnold's Leighton Buzzard No. 52 sand, which is a moderately coarse-grained high-silica sand, with the following results:

Equal Weights of Raynham Sand and Arnold's No. 52 Sand.

Optimum green strength with 4.5 per cent. of moisture	5.4 lb. per sq. in.
Permeability number	40
Dry strength	55 lb. per sq. in.

Two Parts by Weight of Raynham Sand to Three Parts of Arnold's No. 52 Sand.

Optimum green strength with 4.5 per cent. of moisture	4.4 lb. per sq. in.
Permeability number	52
Dry strength	40 lb. per sq. in.

One Part by Weight of Raynham Sand to Two Parts of Arnold's No. 52 Sand.

Optimum green strength with 4.0 per cent. of moisture	3.0 lb. per sq. in.
Permeability number	70
Dry strength	22 lb. per sq. in.

It is apparent from these last three tests that there is a definite possibility of utilising this sand in steel foundries by diluting it with from 1 to 1½ times its weight of a high-silica sand, such as Arnold's No. 52 sand.

Park Moulding Sand, from Redhill, Surrey

This sand occurs above the fuller's earth beds at Redhill, and is supplied by the Fullers' Earth Union, Limited, as a friable sandstone which breaks down easily on milling. The quartz grains are subangular to rounded in form and are well coated with limonite. Abundant small grains of glauconite give a greenish tint to the sand. These glauconite grains add considerably to the bond strength of sand, for, on milling, they crumble to a fine powder which adheres to the quartz grains.

Although the raw sand is of comparatively low refractoriness, the mixtures with 1 to 2 parts of silica sand appear to be refractory enough for steelfoundry use. As will be seen from the bonding properties tabulated below, such mixtures are quite strong enough for normal foundry work.

Mechanical Analysis.—The following is the sieve analysis of this sand:—

B.S.I. Sieves.		
On 5 mesh	0.3	per cent.
„ 8 „	0.3	„
„ 10 „	0.4	„
„ 16 „	2.3	„
„ 22 „	2.9	„
„ 30 „	5.8	„
„ 44 „	14.6	„
„ 60 „	26.6	„
„ 72 „	7.9	„
„ 100 „	15.1	„
„ 150 „	10.2	„
Thro' 150 „	13.6	„
	100.0	„

Moulding Sands and Materials

Refractoriness.—Test-pieces were fired at 1,550 deg. C. for 2 hrs., with the following results:—

Park Sand Alone.—Test-pieces fused completely.

One Part of Park Sand to one Part of Arnold's 52 Sand.—Test-pieces dark brown; grains well fritted together. Test-pieces expanded 2.5 per cent., both laterally and longitudinally.

One Part of Park Sand to Two Parts of Arnold's 52 Sand.—Test-pieces dark brown; grains fritted. Test-pieces expanded 10 per cent., both laterally and longitudinally.

Bonding Properties.—All test-pieces were of A.F.A. dimensions, and were rammed with 10 blows. The results of permeability and green and dry strength tests are recorded below:—

Park Sand Alone.				
Bulk density	1.8	1.82	1.85	1.9
Moisture content. Per cent.	7.9	8.7	9.6	11.0
Permeability No.	17	14	13	5
Green strength. Lb. per sq. in.	31.2	34.2	38.0	31.9
Dry strength. Lb. per sq. in.	197	219	260	334
One Part of Park Sand to One Part of Arnold's 52 Sand.				
Bulk density	1.77	1.81	1.85	1.93
Moisture content. Per cent.	4.6	5.3	6.4	8.0
Permeability No.	111	88	75	70
Green strength. Lb. per sq. in.	24.5	22.3	19.7	13.9
Dry strength. Lb. per sq. in.	95	112	124	164
One Part of Park Sand to Two Parts of Arnold's 52 Sand.				
Bulk density	1.65	1.67	1.72	1.74
Moisture content. Per cent.	2.7	3.9	4.7	6.8
Permeability No.	168	156	140	105
Green strength. Lb. per sq. in.	10.8	10.7	8.3	6.0
Dry strength. Lb. per sq. in.	19.7	28.6	50.0	73.5

One Part of Park Sand to Two Parts of Chelford Sand.		
Bulk density	1.65	1.70
Moisture content. Per cent.	3.2	4.6
Permeability No.	96	81
Green strength. Lb. per sq. in.	11.7	11.4
Dry strength. Lb. per sq. in.	23	48

Moulding Sand from a Quarry near Melksham, Wiltshire

This naturally bonded red sand is being worked by Simmonds & Sons, Frenchay, Bristol. It is being used in a Bristol steelfoundry, and the sample was obtained from that foundry.

Mechanical Analysis.—The following is the sieve analysis of this material:—

B.S.I. sieves.	
On 10 mesh	Nil.
„ 16 „	1.6 per cent.
„ 22 „	1.9 „
„ 30 „	7.7 „
„ 44 „	29.0 „
„ 60 „	40.3 „
„ 72 „	9.4 „
„ 100 „	8.4 „
„ 150 „	1.1 „
Thro' 150 „	0.6 „
	100.0 „

"Clay" content by elutriation, 8.5–9.0 per cent.

Strength and Permeability.—Test cylinders, 2 in. by 2 in., were rammed in an A.F.A. apparatus, the number of blows being 10. The following are the test results obtained:—

Bulk density	1.65	1.68	1.68	1.71
Moisture content. Per cent.	3.2	4.1	4.7	5.0
Permeability No.	183	175	150	190
Green strength. Lb. per sq. in.	6.3	3.4	3.3	3.1
Dry strength. Lb. per sq. in.	35.6	64.9	71.3	71.6

Refractoriness.—Test-pieces fired for 2 hrs. at 1,550 deg. C. were dark brown in colour and showed an expansion of 5 per cent. Slight fritting or sintering was apparent, but there was no actual fusion or distortion.

Practical Use of the Sand.—The following information was supplied by the foundry using the sand: "We are using this sand for light steel castings in green sand. For small castings in dry-sand work we make an addition of 5 per cent. of air-floated Devon ball-clay, which is somewhat stronger in bonding properties than the proprietary clays such as Colbond. For moulding dry-sand work, we make an addition of 25 per cent. of Leighton Buzzard silica sand, and 8 per cent. of air-floated ball clay. The consistency of the sand as received from the pit is fairly constant. This is a new deposit, and the latest samples tend to show a higher clay content, but the grain size remains constant."

I.M. Sand and "Serumite" Bonding Clay from Western Foundry Supplies, Limited, Bournemouth

The I.M. sand is the sand occurring at the top of the measures in the quarry between Bournemouth and Poole, and is the base sand, used with the clay occurring immediately below the sand, in the production of the Dorset moulding sand.

The "Serumite" bonding clay is the above clay dried and finely ground. It is available as a commercial product, and can thus be used for bonding sands other than the I.M. sand with which it occurs naturally.

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Mechanical Analysis.—The following is the sieve analysis of I.M. sand:—

B.S.I. sieves.

On	10 mesh	Nil.	
,,	16 ,, ...	0.1	per cent.
,,	22 ,, ...	0.5	,,
,,	30 ,, ...	3.0	,,
,,	44 ,, ...	18.0	,,
,,	60 ,, ...	46.8	,,
,,	72 ,, ...	12.0	,,
,,	100 ,, ...	15.8	,,
,,	150 ,, ...	2.6	,,
Thro'	150 ,, ...	1.2	,,
		100.0	,,

Permeability and Strength.—The permeability and strength of I.M. sand alone and bonded with Serumite and of the latter bonded with Arnold's No. 52 sand and Chelford sand are stated below:—

I.M. Sand Alone.

Bulk density	1.65	1.65
Moisture content. Per cent.	2.0	2.5
Permeability No.	300	350
Green strength. Lb. per sq. in.	3.7	2.8
Dry strength. Lb. per sq. in.	1.6	4.3

I.M. Sand Bonded with Serumite Clay.

Serumite. Per cent. ...	5·0	5·0	10·0	15·0	15·0	20·0	20·0	20·0
Bulk density	1·66	1·67	1·70	1·77	1·80	1·80	1·85	1·90
Moisture content. Per cent. ...	2·8	3·2	5·2	6·1	8·2	7·1	8·2	9·0
Permeability No.	300	300	191	124	124	70	68	32
Green strength. Lb. per sq. in. ...	10·7	10·1	21·0	25·2	18·8	27·9	21·3	22·0
Dry strength. Lb. per sq. in. ...	8·0	9·1	66	106	114	96	116	151

Arnold's No. 52 Sand Bonded with Serumite Clay.

Serumite. Per cent.	7·5	7·5	10·0	10·0
Bulk density	1·61	1·63	1·65	1·67
Moisture content. Per cent. ...	1·4	1·9	2·0	2·5
Permeability No.	350	300	260	235
Green strength. Lb. per sq. in.	4·5	3·8	8·6	6·5
Dry strength. Lb. per sq. in.	3·8	6·5	6·7	12·1

Chelford Sand Bonded with Serumite Clay.

Serumite. Per cent.	7·5	7·5	10·0	10·0	10·0
Bulk density	1·65	1·67	1·69	1·71	1.73
Moisture content. Per cent.	2·0	2·6	2·1	2·5	3·0
Permeability No. ...	110	91	86	84	84
Green strength. Lb. per sq. in.	7·0	6·7	9·2	10·8	8·4
Dry strength. Lb. per sq. in.	4·6	12·5	11·1	18·1	25·8

Refractoriness.—A.F.A. test-pieces were heated at 1,550 deg. C. for 2 hrs., with the following results:—

I.M. Sand.—Grains fritted, but no actual fusion. No volume change.

I.M. Sand with Serumite.—With 5 per cent. of Serumite there is more fritting than with the raw sand alone and a shrinkage of 2½ per cent. The fritting and shrinkage increase with an increase in the proportion of Serumite; with 20 per cent. of Serumite the surfaces of the test-pieces show slight glazing and a shrinkage of 5 per cent.

Arnold's No. 52 Sand and Chelford Sand with Serumite.—These test-pieces show slight fritting, increasing with the proportion of bond, but less than with the corresponding mixtures based on I.M. sand.

General Remarks.—All the above mixtures are sufficiently refractory for steelfoundry use. These tests emphasise the usefulness of a sand which naturally has a ferruginous coating on the sand grains as the basis for a synthetic moulding sand. The Serumite bonding clay has no outstanding properties, but is a useful bond clay, and "fits" especially well with the ferruginous I.M. sand.

Sand from Brookside Farm, Higher Kinnerton, near Chester

The results of tests made on a sample bag of sand from the above deposit, from which, it is believed, a considerable tonnage of sand similar to this sample could be obtained, are given below. The sand is red in colour and has a natural bond.

Chemical Analysis.—The following is the chemical analysis of the dried sample:—Silica, 92.15 per cent.; alumina, 2.12; iron oxide, 1.65; titanium oxide, 0.18; lime, 0.25; magnesia, 0.42; alkalis (as K_2O), 1.83, and loss on ignition, 1.40 per cent.; total, 100.00 per cent.

Mechanical Analysis.—Sieve analysis gave the under-mentioned results:

B.S.I. sieves.

On	10 mesh	Nil.	
,,	16 ,, ...	0.1	per cent.
,,	22 ,, ...	0.1	,,
,,	30 ,, ...	0.2	,,
,,	44 ,, ...	0.3	,,
,,	60 ,, ...	10.6	,,
,,	72 ,, ...	11.5	,,
,,	100 ,, ...	40.7	,,
,,	150 ,, ...	28.4	,,
Thro'	150 ,, ...	8.1	,,
		100.0	,,

"Clay" content by elutriation, 8.0–9.0 per cent.

Strength and Permeability Tests.—A.F.A. test-pieces were rammed with 10 blows, and gave the following results on test:—Bulk density, 1.63; permeability No., 53; green strength, 6.2 lbs. per sq. in., and dry strength, 39.1 lbs. per sq. in.

Refractoriness.—Test-pieces fired for 2 hrs. at 1,550 deg. C. showed a shrinkage of 10 per cent. with a slightly glazed surface, but no squatting or pronounced fusion. The original red-brown colour changed to a

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grey colour. This is probably due to reaction between the iron oxide and magnesia shown in the chemical analysis.

General Remarks.—This sand has useful properties and merits further investigation. It is possible that it could be used in steel foundries as well as in iron and non-ferrous foundries, but a foundry trial would be necessary before forming a definite opinion as to its value for steel casting.

Three Sandstones from the Durham Area

These are naturally bonded sandstones, marketed by the Northern Sand Supply Company, and were received in the partly crushed state from a steel foundry in which they are used. They are typical rotten rocks having a non-chloritic bond.

Mechanical Analysis.—The following are the sieve analyses of the three sandstones:

B.S.I. sieves.	Eastgate Fine.	Eastgate Rock Sand.	Northern Cleugh Sand.
	Per cent.	Per cent.	Per cent.
On 5 mesh ..	Nil	0.1	0.2
„ 8 „ ..	0.3	1.6	1.6
„ 10 „ ..	0.2	1.1	1.4
„ 16 „ ..	4.8	24.2	21.5
„ 22 „ ..	3.8	17.3	16.2
„ 30 „ ..	5.6	18.4	17.8
„ 44 „ ..	8.4	14.4	13.8
„ 60 „ ..	18.4	10.4	11.2
„ 72 „ ..	9.0	2.3	2.5
„100 „ ..	28.8	4.4	6.6
„150 „ ..	12.8	2.6	3.6
Thro' 150 „ ..	7.8	3.0	3.5
	99.9	99.8	99.9

Refractoriness.—Test-pieces were fired for 2 hrs. at 1,520 deg. C., with the following results:

Eastgate Fine.—Test-piece brown and glazed. Shrinkage, 10 per cent. on both the length and the diameter.

Eastgate Rock Sand.—Test-piece mottled, grains fritted. Shrinkage, 2.5 per cent. on both the length and the diameter.

Northern Cleugh Sand.—Test-piece mottled, grains fritted. Expansion, 2.5 per cent. on both the length and the diameter.

Moulding Properties.—A.F.A. test cylinders, 2 in. by 2 in., were rammed with 10 blows; the test results were as tabulated at the head of the next column.

Sand from Dead Friars Quarries

This sand occurs in the Dead Friars Quarries, Blanchland, Co. Durham. Two samples were taken at the quarry face, and another sample was collected from a wagon of sand delivered to the user.

	Eastgate Fine.	Eastgate Rock Sand.	Northern Cleugh Sand.
Bulk density	1.75	1.92	1.92
Moisture content. Per cent.	7.8	7.0	7.2
Permeability No. ..	214	256	236
Max. green strength. Lb. per sq. in. ..	26.8	29.2	23.5
Dry strength. Lb. per sq. in.	114	234	190

Mechanical Analysis.—Sieve analyses of the three samples gave the following results:

B.S.I. Sieves.	From wagon.	Collected at quarry.	
		Main face.	Right face.
	Per cent.	Per cent.	Per cent.
On 8 mesh ..	Nil	0.2	0.1
„ 10 „ ..	Nil	0.6	0.2
„ 16 „ ..	0.2	6.6	21.7
„ 22 „ ..	13.5	7.4	15.9
„ 30 „ ..	18.5	14.4	17.4
„ 44 „ ..	20.4	21.9	16.4
„ 60 „ ..	21.4	21.3	14.3
„ 72 „ ..	4.1	4.9	2.8
„ 100 „ ..	8.1	9.4	4.4
„ 150 „ ..	5.1	5.6	2.6
Thro' 150 „ ..	8.7	7.7	4.2
	100.0	100.0	100.0

Bond Strength and Permeability Tests.—The results of tests on the bond strength and permeability follow:

Sample from Wagon.

Moisture. Per cent.	3.6	4.1	5.0	6.0	8.0
Permeability No. ..	42	58	60	60	53
Green strength. Lb. per sq. in.	20.4	25.5	25.8	22.0	18.1
Dry strength. Lb. per sq. in.	56.6	91.0	156.2	180.7	182.3

Samples collected from Quarry.

	Main face.		Right face.	
Moisture. Per cent.	6.7	8.6	6.2	7.7
Permeability No. ..	38	32	40	32
Green strength. Lb. per sq. in. ..	21.3	19.7	21.0	13.4
Dry strength. Lb. per sq. in. ..	179.0	189.0	142.0	144.0

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Sample from Wagon Milled with Arnold's Leighton Buzzard No. 52 Sand.

	Two parts of Blanchland to one part of silica sand.			Equal parts of Blanchland and silica sand.		
Moisture. Per cent.	3.8	5.0	5.7	3.1	4.1	4.8
Permeability No.	71	96	88	95	98	91
Green strength. Lb. per sq. in.	8.6	10.0	6.1	7.0	7.2	7.7
Dry strength. Lb. per sq. in. ..	80.5	88.1	91.0	15.3	18.5	24.5

Refractoriness.—Test-pieces from all the samples after firing for 3 hrs. at 1,550 deg. C. showed fritting, but no actual fusion. The material from the right face was more refractory, but rather weaker in bond, than the main face material or the "run-of-quarry" material supplied in the wagon. The refractoriness is quite satisfactory for the material to be used in steel foundries.

General Remarks.—The samples taken at the quarry are a little coarser in grain size than that from the wagon; probably the latter is likely to be more representative of the run-of-quarry material. The tests made indicate that the run-of-quarry material is quite comparable in general properties and quality with that produced, and milled, at other quarries in the Tow-Law/Stanhope area. The milled product from a heavy mill is stronger and better as a moulding sand than that from a light mill; heavy milling gives a better grading and better distribution of the bond.

Leighton Buzzard (Messrs. J. Arnold & Sons, Limited) Steel Moulding Sand No. 27

The following is the sieve analysis of the material:

B.S.I. sieves.	
On 5 mesh	Nil.
„ 10 „	0.5 per cent.
„ 16 „	0.2 „
„ 22 „	0.2 „
„ 30 „	0.4 „
„ 44 „	0.7 „
„ 60 „	1.6 „
„ 72 „	1.7 „
„ 100 „	12.5 „
Thro' 100 „	82.2 „

"Clay" grade by elutriation (included in "through 100 mesh"), 15.9 per cent.

By comparison with standard cones the refractoriness was found to be 1,670 deg. C. The following bond-strength and permeability values were obtained:

Sand as received, dried at 110 deg. C.

Moisture. Per cent. ..	3	5	7	15
Core weight. G. ..	165	165	165	195
Green strength. Lb. per sq. in.	17.9	**18.5**	17.3	8.9
Dry strength. Lb. per sq. in.	—	71.0	86.0	388.0

Permeability No. at 5 per cent. moisture, 46.5.

Mixtures of this material with Arnold's 52 sand and with Chelford sand gave the following results:

Two Parts of Arnold's 52 Sand to one of Special 27.

Moisture. Per cent. ..	1.5	2.0	3.0	6.0
Core weight. G. ..	170	170	170	190
Green strength. Lb. per sq. in.	5.15	**5.89**	4.93	2.47
Dry strength. Lb. per sq. in.	—	—	—	116.0

Permeability No. at 2.0 per cent. moisture, 92.8

Two Parts of Chelford Sand to one of Special 27.

Moisture. Per cent. ..	1.5	2.0	3.0	6.5
Core weight. G. ..	170	170	170	180
Green strength. Lb. per sq. in.	5.02	**5.81**	4.97	2.55
Dry strength. Lb. per sq. in.	—	—	—	141

Permeability No. at 2.0 per cent. moisture, 69.5.

Three Parts of Arnold's 52 Sand to one of Special 27.

Moisture. Per cent. ..	1.0	1.5	2.0	3.0
Core weight. G. ..	165	165	170	175
Green strength. Lb. per sq. in.	2.81	**4.00**	3.70	2.49
Dry strength. Lb. per sq. in.	—	—	—	35.0

Permeability No. at 1.5 per cent. moisture, 150.

Three Parts of Chelford Sand to one of Special 27.

Moisture. Per cent. ..	1.0	1.5	2.0	3.5
Core weight. G. ..	170	170	170	175
Green strength. Lb. per sq. in.	2.91	**3.89**	3.53	2.36
Dry strength. Lb. per sq. in.	—	—	—	40.0

Permeability No. at 1.5 per cent. moisture, 117.

Test-pieces of the above four mixtures sintered at 1,600 deg. C.

The better bond strength given by admixture with Arnold's 52 sand is probably due to the improved grading obtained. The grains would seem to pack in a manner conducive to greater strength.

Moulding Sand from The Alderley Edge Red Moulding Sand Company, Limited, Alderley Edge, Cheshire

This deposit is of considerable extent, and the samples examined were the unmilled soft sandstone and the prepared milled moulding sand. The unmilled material is a soft crumbly sandstone composed of rounded quartz grains and aggregates, more or less coated with a ferruginous (limonitic) clay.

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Chemical Analysis.—Chemical analysis on samples dried at 105 deg. C. gave the following results:

	Unmilled.	Milled.
	Per cent.	Per cent.
Silica	86.58	88.85
Alumina	7.45	5.75
Iron oxide	0.96	0.85
Titanium oxide	0.31	0.25
Lime	0.48	0.45
Magnesia	0.51	0.40
Alkalis (as K_2O)	1.96	1.85
Loss on ignition	1.65	1.45
	99.90	99.85

Mechanical Analysis.—The following are the results of sieve analyses on the material:

B.S.I. sieves.	Unmilled sample milled in laboratory.	Milled sample.
	Per cent.	Per cent.
On 5 mesh	Nil	Nil
„ 8 „	0.2	0.8
„ 10 „	0.2	0.8
„ 16 „	0.3	2.0
„ 22 „	0.3	0.8
„ 30 „	1.0	1.2
„ 44 „	7.9	6.7
„ 60 „	23.2	12.8
„ 72 „	9.6	5.3
„ 100 „	24.9	17.2
„ 150 „	18.0	22.3
Thro' 150 „	14.4	30.1
	100.0	100.0

The unmilled sample contained rather more clay than the sample supplied milled. It is probable that the latter had been ground in a mill much heavier than the laboratory mill and more of the quartzitic aggregates had been broken down. The milling tests indicate that fairly heavy milling is desirable to develop properly the bond strength of the sand.

Moulding Properties.—For these tests the sample supplied unmilled was milled in the laboratory; the test-pieces were rammed in the A.F.A. rammer, some with 3 blows, some with 10. The test results obtained were as shown in the table at the foot of the page.

Refractoriness.—The fusion point of the sample supplied unmilled was 1,630 deg. C. and of the milled sample 1,650 deg. C. Test-pieces fired at 1,550 deg. C. were grey-white in colour, the original red colour having changed owing to reactions between the iron oxide, lime, magnesia and silica. This sand is refractory enough for steel-foundry use, but its bond strength would not allow of much dilution with a silica sand.

(To be continued.)

Mr. Donald Nelson, chairman of the American War Production Board, stated recently that American steel production in 1943 would be nearly twice that of the Axis, which is estimated at 50 to 55 million tons. In a report on the steel expansion programme at the end of the first year of war, he said that the U.S. capacity had already increased to more than 89,000,000 tons, and would rise to an estimated 97,000,000 tons when the peak was reached.

Colombia is making a start in reviving and expanding her iron and steel industry. In the Pacho district, a blast furnace has been recommissioned for small-scale smelting of iron ores. At Medellin a steel plant has been constructed with two electric furnaces for melting scrap, two gas furnaces for heating ingots, and roll stands for rods and small joists. The capacity of the rolling mill is put at 100 tons per day. Further furnaces and rolling equipment for plates, wire and structural shapes are being installed.

	Unmilled sample milled in laboratory.			Milled sample.				
	Test-pieces rammed 3 times.							
Bulk density	1.61	1.61	1.62	1.60	1.60	1.60	1.60	1.62
Moisture. Per cent.	2.6	3.9	5.9	2.8	4.2	4.6	5.9	6.5
Permeability No.	71	63	52	120	106	106	88	82
Green strength. Lb. per sq. in.	7.4	6.0	4.0	4.7	3.5	3.1	2.7	2.5
Dry strength. Lb. per sq. in.	16.0	22.0	48.0	7.0	11.8	12.5	38.0	32.5
	Test-pieces rammed 10 times.							
Bulk density	1.63	1.63	1.65	1.62	1.62	1.62	1.63	1.64
Moisture. Per cent.	2.6	3.9	5.9	2.8	4.2	4.6	5.9	6.5
Permeability No.	49	46	42	90	80	78	65	65
Green strength. Lb. per sq. in.	11.9	9.5	7.5	6.4	5.6	5.3	4.6	4.1
Dry strength. Lb. per sq. in.	23.0	32.0	72.0	12.0	22.6	28.0	57.0	53.5

LADLE METALLURGY

By J. H. WILLIAMS, B.Sc.

General Discussion initiated at a meeting of the London Branch of the Institute of British Foundrymen

The written contributions to a discussion on ladle metallurgy, opened by Mr. J. H. Williams, at a recent meeting of the London Branch of the Institute of British Foundrymen, were printed in our issue of December 17 last. The oral discussion was opened by the Branch-President (Mr. R. B. Templeton), who said Mr. Williams had rightly emphasised that the maximum advantage of ladle additions was obtained when applied to good metal. This was fundamental. Personally he had had considerable experience with "Chromex," and this was certainly a most suitable way of adding chromium. The losses involved in alloy additions—this did not apply to nickel but it certainly did to chromium—were a very serious matter. Presumably the alloys became trapped in the slag which formed on the top of the ladle, and it was a matter on which some information would be valuable from those who had had considerable experience. Mr. Williams had not touched on the ladle addition of copper, which was of real interest. Perhaps it was rather outside the scope of the paper, but some information on the ladle itself would be valuable. Mr. Wells had touched upon it from the patching and lining point of view, but he would like to hear something about the shape and size and general dimensions of the ladle, particularly from the point of view of the conservation of heat and the elimination of slag.

Technique of Spout Additions

MR. L. E. SLATER, commenting on the actual process of adding the alloy to the ladle, said he had watched his metallurgist doing this, and had noticed that the action of the stream from the spout threw the alloy to the sides. Therefore he had been trying to devise some means of putting the addition into the back of the stream. If one watched the alloy in the ladle it would be seen to roll towards the stream, but if it were put at the back of the stream it was thrown on top of the roll. Therefore he would be interested to hear if anyone had found a method of putting the addition in the back of the stream so that it rolled on towards the stream and into the ladle.

The BRANCH-PRESIDENT said it was possible to have a sort of waterfall arrangement in the spout, which helped considerably. If the addition were put fairly far back there was a step-down in the trough, and that helped to hold the alloy satisfactorily.

MR. WILLIAMS said that he had found it advisable to sift out the dust before adding the alloy. He could not state any definite size of particle, but the alloy should be added in a granular form. If Mr. Slater's metallurgist were adding the alloy in a powdered form, the process was not as a rule satisfactory, because there was a tendency for the powder to be blown away. Additions in the granular form could be made quite satisfactorily with ferro-silicon, ferro-silico-manganese, and also moderately successfully with ferro-chrome.

Low Losses from "Chromex"

MR. MCRAE SMITH said he was glad to hear Mr. Williams speak of the great value of silicon additions, apart from other alloy additions, of a purely compositional nature. The author had stated that latterly he had obtained greater success with regard to the reduction of losses by using granular ferro-chrome and that he had applied the same principle to the addition of ferro-silicon. Actually, he had been advocating and using powdered silicon of high silicon content, but this was not now so easy to procure. If granular ferro-silicon were used, he believed it was necessary to go to ¼-in. mesh—or the like—which did not get carried away by eddy currents and was not caught up by the slag. Ferro-chrome presented difficulties as ladle additions. At one time he invariably added chromium in the cupola as briquettes, but latterly he had used "Chromex" with great success and found the loss was very small. Personally, he did not feel there was a very great field for ladle additions of ferro-alloys in ordinary foundry practice.

With regard to the point raised by Mr. Slater, he agreed that the addition should be made as near to the tapping hole as possible, but it was also very important to see that the shape of the channel was correct. In most jobbing foundries they were rather lax in making up the channel anyhow, but if the channel was reasonably shallow and fairly wide, the loss was much less because the finely powdered addition had a bigger surface to float on and had a greater chance of being absorbed.

Silicon additions he did not think had been taken as much advantage of as they should have been in the ordinary jobbing foundry. The effect on the graphite structure was more important than the question of increase in strength, and it was very handy in a general jobbing foundry to run a general mixture with a reasonably low silicon content—say 1.5 per cent.—and then adjust, where necessary, with silicon additions. This was very easy for any jobbing foundry to do, but it had not been taken advantage of. If extra strength was required with silicon additions, it must be done with reasonably low carbon irons.

Two-Cupola Method

Commenting on the written contribution by Mr. Francis, and the stress laid on the two-cupola duplexing method, Mr. McRae Smith said this was very useful for the type of job it was originally applied to in this country, *viz.*, chilled castings, but in these days of fuel economy, this process was very expensive in fuel as far as pressure-type castings were concerned. With this type of casting, although the composition was

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important, it was also necessary to look after the cooling of the casting to get equal or progressive solidification. It was a good method of controlling chill.

Size of Alloy Additions

MR. WILLIAMS said he agreed with all that Mr. McRae Smith had said, particularly about the cross-section of the spout. Personally, he had never used ferro-silicon as large as ¼-in. sized pieces, but he had always taken great care to eliminate dust. In his experience it was much better to sift out the dust in any alloy, but it was particularly important with ferro-chrome additions. There was an excellent Paper on melting practice by Braidwood in the Proceedings of the Institute for 1938-39, in which mention was made of adding 4 to 6 per cent. carbon ferro-chrome of Brazil nut size to the ladle with 100 per cent. recovery, but he had not had the courage to try that.

MR. MCRAE SMITH said he knew of that Paper, but he certainly would not have the audacity to do that. However, he had heard of a case not very long ago in which some experienced people used ferro-molybdenum of walnut-size after covering the ladle with about 6 in. of metal, and they had obtained extraordinarily good results. The yield of molybdenum was almost the theoretical.

MR. WILLIAMS said that he was surprised to learn that such large-sized pieces of ferro-molybdenum could be added satisfactorily to the ladle when one considered the high melting point of the alloy.

Ferro-Phosphorus Additions

MR. AUGSTEIN, speaking of ladle additions of ferro-silicon for castings suitable for the electrical industry, said he preferred to use silicon briquettes in the cupola charge. As to manganese ladle additions, would Mr. Williams enlarge on that subject and state in what particular cases he would suggest this? He agreed that with chromium additions it was very difficult to get a reasonable result by adding crushed ferro-chrome to the ladle. In any case, not more than 0.6 per cent. chromium should be added in this manner. Referring to the author's remarks on the ladle additions of ferro-phosphorus, would Mr. Williams agree that large pieces of phosphoric pig-iron could be added to the cupola charge with a similar result?

MR. WILLIAMS replied that he thought he had made it clear—but apparently he had not—that the great value of ferro-silicon additions in a foundry making a variety of castings was the ability to add crushed ferro-silicon to the normal mix if a softer iron was required. In a large jobbing foundry a few castings of a particularly soft kind might be required, but it was not feasible to run a special charge for these castings. In that case it was possible—he had done it many times—to soften up the iron by adding ferro-silicon to the ladle. No doubt they had all met the customer who complained that his castings were too hard and were not so easily machineable as he would like. What the customer really wanted was something extremely soft, and there was no reason why that wish should not be gratified. Mr. McRae Smith had also pointed out the advantage in a jobbing foundry of running a standard mix and adjusting with ladle additions of ferro-silicon. It was possible to soften the iron to any desired extent, and he (the speaker) had made additions so as to bring the total silicon content of the metal up to 2.75 to 3 per cent. He agreed with Mr. Augstein that if the quantity of castings warranted it and it was required to run, say, iron with 2.5 to 2.75 per cent. of silicon, then it would be better to adjust the composition of the metal in the cupola by adding high silicon pig-iron or silicon briquettes.

With regard to manganese additions to the ladle, little attention had been given to them in this country. A Paper had been published in America by McPherran, of the Allis-Chalmers Manufacturing Company, Milwaukee, in which the addition to the ladle of 0.3 per cent. of manganese in the form of a ferro-silico-manganese was advocated for scavenging and refining the iron.

For some years he had been concerned from time to time in the production of castings for chemical plant, such as vats, mixers and superphosphate machines. From many experiments he had come to the conclusion that the best iron for these jobs—other than very expensive highly-alloyed irons—was one which was fairly dense, free as much as possible from pinholes, and had a low sulphur content. Phosphorus did not seem to be an important factor. These irons he had made by incorporating briquetted ferro-silico-manganese in the cupola charge, followed by an addition of nearly carbonless ferro-silico-manganese to the ladle and subsequent desulphurisation with soda ash. Castings made in this manner and subject to attack by 71.5 per cent. sulphuric acid, as in a superphosphate plant, had lasted twice as long as those made from a common iron mix. The iron was poured from a teapot ladle.

Regarding Mr. Augstein's query whether large lumps of phosphoric pig-iron could be added to a cupola charge of low phosphoric iron with the same result as adding an appropriate quantity of ferro-phosphorus to the ladle, the answer was in the negative. When phosphoric pig-iron was mixed with hematite iron in the cupola, little or no superheating effect was obtained because the metal came down at a temperature corresponding to the melting point of an iron with a given content of phosphorus.

MR. SCOTT (Henry Eadie, Limited) expressed his interest in what had been said concerning the superphosphate plant having just made one for a customer who asked for it in ordinary cast iron. Could Mr. Williams say what would be the life of the castings he had mentioned as compared with ordinary cast iron?

MR. WILLIAMS replied that he could not say. All he knew was that the castings made in the manner he had described stood up to about double the life of those cast from common iron without any treatment of the metal.

Ladle Metallurgy

Graphite and Ferro-Chromium Additions

DR. A. B. EVEREST, speaking with regard to inoculation by graphite—which the author had not carried very far—said it seemed from the published information that this was a rather hazardous procedure. He had seen the results of the use of Mexican graphite as an inoculant, and this suggested the form of graphite which could be successfully used was a factor of some importance. In one well-known works which made machine tools for all over the world, Mexican graphite was added, and the makers claimed to get really good castings.

In the early days of alloy addition developments, some people were successful in adding ferro-chrome in the ladle, but they discarded both the large lumps and the dust. By working in this way it was possible to obtain a satisfactory yield in association with a hot metal, and would be effective for additions up to ½ per cent. To-day he would say that chrome pig was the more satisfactory form.

Another question was the influence of ferro-chromium carbon content when making ladle additions. From his own work his impressions were that high carbon, that was 6 to 8 per cent., ferro-chrome should give the more succesful results, because, if one worked with low carbon, there would be more difficulty from the crushing point of view.

As to phosphorus additions to the ladle, he said it had come to his notice recently that quite a quantity of ferro-phosphorus was being sold in this country, and he would like to find out where it went! In the foundry industry there was a tendency to get rid of phosphorus as much as possible, and he was hoping Mr. Williams would have said what was added to the ladle to reduce the phosphorus.

Ferro-Phosphorus

MR. WILLIAMS said he was surprised to hear that there was a comparatively large amount of ferro-phosphorus being sold in this country, but he could not imagine it going anywhere else than to foundries. As a matter of fact, he had introduced its use in one or two foundries years ago for the reason given in his opening remarks on the subject of ladle additions of ferro-phosphorus. It had a much greater application on the Continent and in America, where low phosphoric pig-irons prevailed. Briquetted ferro-phosphorus was used to some extent in Germany. He had been informed that there had been no serious increase in the consumption of ferro-phosphorus. He, personally, preferred to add ferro-chrome whenever possible to the cupola charge. If one were compelled to make ladle additions, then much greater care was required than when using ferro-silicon.

He had intended to omit the question of high- or low-carbon ferro-chrome, because for some years, although certain foundries had ordered 6 to 8 per cent. carbon ferro-chrome, he believed he was correct in saying that the grade usually supplied was 4 to 6 per cent. carbon, as the ferro-alloy makers no longer produced the 6 to 8 per cent. carbon grade of ferro-chrome. Some 15 years or so ago, the Germans laid great stress on the addition of carbon-free ferro-chrome to cast iron. It was claimed that better heat-resisting cast iron was obtained by the use of this alloy in place of high-carbon ferro-chrome, and the improvement was attributed to a difference in physical structure brought about by the formation of carbides from the carbon already present in the molten iron.

Multiple or Simple Alloys?

MR. MCRAE SMITH said there was another point with regard to manganese-silicon additions to the ladle. Had Mr. Williams any experience—he himself had not—whether it was more beneficial to use a direct alloy of manganese and silicon rather than, say, a mixture of ferro-managanese and ferro-silicon? He believed some recent work had been done in America in which better results had been obtained by using a direct alloy of manganese and silicon than ferro-manganese and ferro-silicon.

MR. C. H. KAIN remarked that a good deal of the discussion had been on the question of the provision of small quantities of special metals in the ironfoundry. In his view, this seemed to be a complete argument in favour of concentration or rationalisation or whatever one cared to call it. Surely in these days the general foundry should avoid these special orders; they should be diverted to foundries catering for that type of material.

Further, there was still a great deal of talk about coarse and fine graphite. He was rather behindhand in his technical reading, but he felt the time had come when graphite should be reduced to a numerical value. The Cast Iron Sub-Committee of the Institute had done some work in that connection but they had not done anything yet to reduce graphite to a numerical value, equivalent to the McCance grain sizes which were now used for steel.

Multiple Alloys Preferred

Replying to Mr. McRae Smith on the question of separate additions of ferro-manganese and ferro-silicon as compared with a ferro-silico-manganese alloy, MR. WILLIAMS said that the latter was by far the better form of addition and all his manganese additions had been carried out with ferro-silico-manganese. At the same time, although he had not tried it, he could readily appreciate that a ferro-manganese with low carbon content would be quite efficacious.

DR. A. B. EVEREST, commenting on Mr. Kain's remarks, thought he had rather missed the point about ladle metallurgy in suggesting that special metals should be produced in foundries laid out for them. Ladle inoculation must be done on a large scale, probably for the whole output of the foundry, for it gave a measure of control which could not be obtained in any other way.

Finally, with regard to coarse and fine graphite, he pointed out that the American standards were being used in this country to some extent.

MR. KAIN suggested they should be used generally and that we should stop speaking of coarse and fine graphite.

Ladle Metallurgy

MR. CHARLES CLEAVER asked for information with regard to the use of steel turnings in the ladle which he suggested might be highly dangerous, as he rather thought that what was melted was the oxide running through the iron, which resulted in pinholes in the resulting casting. The turnings came to the top in the slag.

With regard to Mr. Kain's suggestion as to the concentration of the industry, this appeared to overlook the fact that specialised foundries were not inclined to deal with small quantities of odd castings. As a matter of fact, the jobbing foundry came in where the specialised foundry left off.

The CHAIRMAN suggested that Mr. Kain's point was that the type of casting should be specialised rather than the elimination of foundries which were making general castings.

MR. KAIN replied that ladle metallurgy was practised daily at his works for the full output. His previous comment was directed to the point that so much of the discussion had been concerned with the production of small quantities of special metal and he still maintained that jobbing foundries would be well advised to deflect these orders to foundries which had that particular type of metal in routine production.

Copper in Cast Iron

MR. MOYLE suggested that the use of copper in cast iron was worthy of consideration, and recalled that in one particular instance some thin castings were made which there was difficulty in machining. A little copper was added to the ordinary mixture, and the customer was delighted with the castings. Therefore, he considered it well worth while for jobbing foundries to make a few experiments in this direction, especially when copper was relatively cheap. In the particular case in point he used scrap copper such as copper tubes, and the results were very successful indeed.

MR. WILLIAMS, in reply to Mr. Moyle, said he could not say anything in regard to copper additions as he had never added that metal to cast iron.

With regard to Mr. Cleaver's remarks, he said he had tried adding steel turnings to the ladle some years ago, and found, as Mr. Cleaver had, that the turnings did not melt. They became entangled with air, and most of them came up to the top of the iron in the ladle.

Vote of Thanks

MR. W. H. ASTON, proposing a hearty vote of thanks to Mr. Williams, said he was one of the oldest members of the Institute, but unfortunately he had not been to the meetings of the Branch since the war started. After listening to Mr. Williams' most interesting Paper and the discussion upon it, however, he had come to the conclusion that if all the meetings were of similar interest he had missed a great deal, and could have spent his time more profitably by coming to the meetings than by going home.

MR. PYAT seconded the vote of thanks, which was cordially given.

MR. WILLIAMS, expressing his appreciation, said the discussion had proved the whole subject was interesting to the members, and he appreciated the manner in which his opening remarks had been received.

AMERICAN FOUNDRY EQUIPMENT MANUFACTURERS' MEETING

The annual meeting of the (American) Foundry Equipment Manufacturers' Association in Cleveland, October 30-31, was devoted chiefly to consideration of problems of man-power, salvage, the procurement of materials, and the field of foundry equipment after the war. In a Paper read at the meeting, J. K. Johnson, of the War Man-power Commission, Cleveland, discussed "The Man-power Problem—To-day and To-morrow." Mr. Johnson stated that industry cannot possibly hope to retain many of the men they considered necessary six months ago. To fill in the needs, industry must make maximum use of men above the military age, of women, of the handicapped, and of the wounded who have been returned to civilian life. Other problems facing industry include training, pirating, turnover, and absenteeism.

Mr. Earl L. Shaner, president, Penton Publishing Company, spoke on "What Lies Ahead for American Industry," and paid tribute to the way in which the manufacturers of foundry equipment have met every challenge of the rapidly expanding war-production programme. Future success of all industry will require more efficient management, he stated, for management must get along with man-power that is much less efficient.

Mr. W. H. Bean, chief of the Foundry Equipment and Supplies Unit of the W.P.B., discussed problems of the foundry equipment industry in meeting the demands of the war effort. Mr. Lewis M. Lind, Board of Economic Warfare, Washington, dealt with "Foundry Equipment and the Post-War Period." After outlining the organisation and work of the Board, he stated that the post-war profits which will affect the foundry equipment industry and which in turn can be influenced by equipment manufacturers are as follow: Post-war status of the durable goods industries in the United States; labour relations; plant modernisation and development of new plants. He suggested that equipment manufacturers endeavour to find what other organisations are considering in their post-war planning, and then determine where castings can fit into these plans.

More than 61,000 American steelworkers entered the armed forces between October 1, 1940, and June 30, 1942, according to the American Iron and Steel Institute. Despite this loss of trained men, the tonnage of steel produced by the industry has increased substantially since the autumn of 1940. As of June 30, the steel companies surveyed had 789,279 employees on their payrolls; nearly 65 per cent. of these workers fall within the 20-44 year age group.

TWO CLAMPS FASTEN BROKEN TOP PART

By "W. G."

The most vexing thing that can happen in the course of a moulder's work is for some portion of the rammed sand in the top part to fall away when closing the mould for the last time. Yet, ninety-eight times out of a hundred this unexpected mishap occurs when using a cracked top part which appears to have been temporarily secured by a clamp. Either the mould opens slightly or a part of the mould surface falls away when the box is turned over on the trestles, and no amount of sprigging will make the risk of closing the mould worth while, especially when much time and labour has been expended on the job in hand. If time is not to be spared to plate a broken box, the only safe and certain way of avoiding a "drop" is to employ two clamps, one over and one under the box bars.

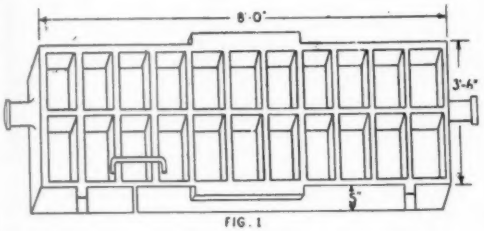

FIG. 1

Fig. 1 shows a top part, 8 ft. by 3 ft. 6 in. by 5 in., with a crack on one side and a clamp to keep the broken parts together. It had been used three or four times and, on being turned over on the trestles prior to closing, portions of the sand nearest the clamp had either dropped off or the surface had opened due to the jaws of the clamp giving way. As the mould of this particular job was some distance from the clamp, the risk of a waster was very remote, as the fractured part closed over a very broad joint, this being the reason why plating of the top part was put off until some other time.

When the top part had to be used again for the moulding of a "rush" job, with no time to spare for plating it, and when no risk of a mishap could possibly be taken, the writer used two clamps fixed as at Fig. 2, closing the crack so that, when the top part was turned over on the trestles, there was no opening of the broken part either on the surface of the mould or on the top side of the rammed sand.

Wrought-iron wedges were used to tighten the clamps, checking up on them occasionally to see that they had not worked loose. This cracked top part proved so reliable after being double-clamped that it was used over two dozen times, and can still be used without risk. Never rely on one clamp to make good a cracked top part. Either two clamps or, better still, if time permits, the more practical method of bolting a plate over the broken part.

COPPER SALVAGE IN AMERICA

In his review of the activities of the Reconstruction Finance Corporation and its subsidiaries, Metals Reserve Company and Defense Plant Corporation, Mr. C. B. Henderson referred to the Copper Recovery Corporation, which was formed by the copper and brass industry to act as agents for Metals Reserve Company in the purchase of approximately 200,000 tons of copper and copper base alloys now held by 100,000 holders in the United States, representing idle or excessive inventories. Over 37,500 net tons have been scheduled by allocation and by last October over 25,000 tons had been disposed of, with additional purchase contracts outstanding covering 12,000 tons and not included in the allocations. A programme has been put into operation whereby secondary refiners are purchasing monthly 11,500 tons of copper contained in copper alloy scrap for the production of electrolytic copper. Up to October last, 71,000 tons of copper had been recovered from scrap material and allocated to various essential industries. Direct purchases have been made from certain manufacturers and dealers holding large inventories, including approximately 1,303 tons of electrolytic copper, approximately 379 tons of tin cast metal, 9 tons of cadmium, and 14 tons of cast metal anodes.

A.F.A. 1943 APPRENTICE CONTEST

The Apprentice Training Committee of the American Foundrymen's Association is continuing its annual Apprentice Moulding and Patternmaking competition this year. The next contest to be held in connection with the convention of the Association, which is scheduled for St. Louis on April 28, 29 and 30, is open to all indentured apprentices with contests in four classes, namely, grey iron moulding, steel moulding, non-ferrous moulding, and patternmaking. The first, second and third prizes of $30.00, $20.00 and $10.00 respectively in each of the four groups will be awarded to the winning entries if submitted from local competitions. Local competitions may be held by either individual foundries or pattern shops or by a group of foundries or local foundry association or chapter of the A.F.A. This competition, first started in 1924, has become an outstanding event in the foundry field. Last year apprentices from some 60 of the best known industrial plants of the country participated.

MINERAL RESOURCES OF FRENCH NORTH AFRICA

SUPPLIES AVAILABLE TO UNITED NATIONS

Under the recent agreement between the Governments of Great Britain and the United States, the Combined Raw Materials Board of the United Nations will allocate the mineral supplies from North Africa between the two principal consumers. It is understood that the United Kingdom is to receive iron ore, pyrites, phosphate rock, super-phosphates, zinc and lead ores, while the United States will acquire the whole of the surplus of manganese ore and cobalt. Some notes on the volume of these materials which are likely to be available to assist the war effort of the United Nations are appended.

Manganese Ore.—This ore is fairly widely distributed over the whole of North Africa but only French Morocco is a major producer, accounting for an average of 80,000 tons in each 1937 and 1938. With the outbreak of war these deposits were rapidly developed and in the last two years more than 100,000 tons of ore per annum has been produced. It is likely that this production can be maintained, especially as the ore is of good quality. In 1938, exports of manganese ore from French Morocco were over 42,500 tons.

Iron Ore.—North African iron ore deposits have been actively exploited for some years, and in 1938, just over 4,000,000 tons of ore were produced, of which about 3,000,000 tons came from Algeria, 800,000 tons from Tunis and 266,000 tons from French Morocco. The ore is of a good grade; it is suitable for blending with British ore, which has been responsible for the large tonnage of North African ore taken by British ironworks up to the fall of France. Exports of Algerian ore were around 2,700,000 tons in 1938, while Tunis exported nearly 800,000 tons and French Morocco 132,500 tons. It was reported a short time ago that a blast furnace was being erected at Casablanca to facilitate treatment of the ore on the spot and to enable an export trade in pig-iron to be developed. It is not known how far this project has materialised.

Phosphate Rock.—From the point of view of tonnage the largest mineral industry in French North Africa, apart from iron ore, is that devoted to the mining of phosphate rock, of which ample resources are available. In 1938, Tunis produced 1,900,000 tons of phosphate rock with an estimated content of Ca tribasic phosphate of 1,170,000 tons; production in French Morocco was 1,464,000 tons with a content of 1,126,000 tons, while Algeria produced 575,000 tons with a phosphate content of 366,000 tons. This quantity of phosphate rock of the order of 4,000,000 tons per annum is destined for Great Britain and will more than cover all the requirements of this country. Prior to the war the superphosphate industry was expanding and produced about 158,000 tons of superphosphates in 1938, almost double the figure of 1936 output. The export trade in phosphate rock had been actively developed before the war, Tunis exporting 1,566,000 tons in 1938, a decline of over 300,000 tons in 1937; French Morocco exported around 1,500,000 tons annually in 1937 and 1938, with Algeria averaging between 500,000 and 600,000 tons per annum. Superphosphate exports from French Morocco and Algeria were of the order of 23,000 tons per annum just before the war.

Cobalt.—French Morocco is one of the world's principal sources of cobalt, world production of which has been expanding very rapidly. On the basis of cobalt content French Morocco produced 13,500 cwts. in 1938, against 26,000 cwts. from the Belgian Congo and nearly 29,000 cwts. from Northern Rhodesia. Prior to the war, a substantial trade was done in the export of cobalt ore, which amounted to 103,500 cwts. in 1938 against 70,000 cwts. in 1937, and 79,000 cwts. in 1936. With the British Empire supplying the Mother Country with ample quantities of cobalt ore, the Raw Materials Board has naturally allocated all North African production to the United States.

Lead, Zinc, etc.—Useful quantities of lead, zinc and other metals are also available in French North Africa. Between 1936 and 1938, Tunis produced between 20,000 and 24,000 tons of lead ore and an average of 800 tons of zinc ore each year. Algeria accounted for 8,000 tons of zinc ore in 1937 and French Morocco for nearly 5,000 tons in the same year. These industries are capable of much higher outputs, as there was a distinct decline in production prior to the war. As indicated above these ores are destined under the present arrangements for the United Kingdom. The utility of zinc ore will depend on surplus refining capacity being available.

The area also produced a useful tonnage of quicksilver, production of which expanded in Tunis and Algeria two and a half times between 1936 and 1938, when total output was about 36,000 lbs. In that year, Algeria exported 31,000 lbs. of quicksilver, three times the amount exported in 1936. Algeria and French Morocco also provide antimony ore, exports of which prior to the war reached 2,500 tons per annum. Some tungsten and molybdenum are also available, French Morocco having produced ore with 3,300 cwts. MoS_2 per annum prior to the war, with exports of ore at nearly 6,000 cwts. in 1938. Pyrites mining has been developed in Algeria to the level of approximately 40,000 tons per annum, containing nearly 50 per cent. sulphur.

High-duty Cast Iron. The International Meehanite Metal Company, Limited, of 66, Victoria Street, London, S.W.1, have compiled a 32 page booklet with the specific object of enabling engineers and designers to choose the correct grade of Meehanite for any particular service. The compilers, after a short introduction, have given a general classification relating to service requirements to the types of Meehanite available, and have then very fully listed the mechanical properties of each type. Towards the end very helpful data are presented on the subjects of heat-treatment, stress relief, welding and machining. The pamphlet is strictly businesslike in presentation, as should be the case with all trade literature in wartime.

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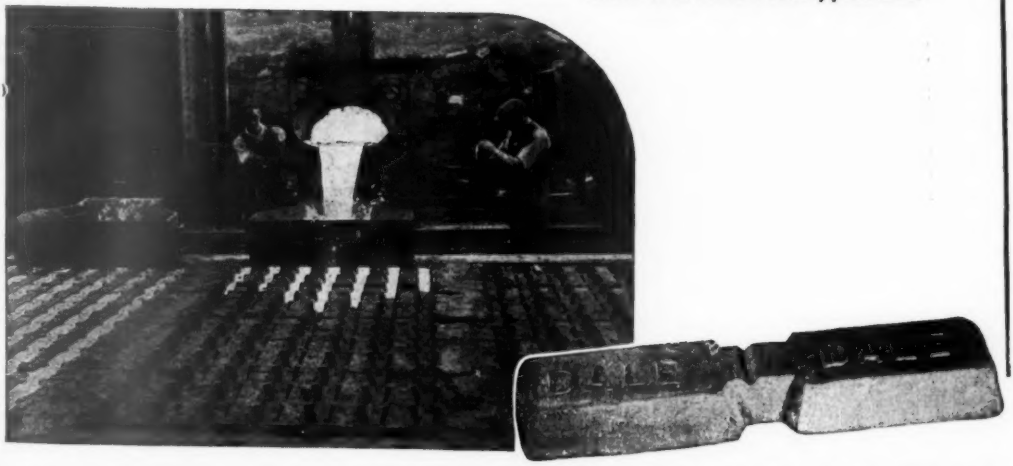

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

OBITUARY

MR. W. Y. LONGMORE, senior partner in the firm of Longmore Bros., tube manufacturers, Springfield Works, Darlaston, died at Walsall recently, at the age of 66.

MR. GEORGE HENRY MEDLEY WILLIAMS, late of the Hepburn Conveyor Company, Limited, and Williams & Womersley, Limited, died at Wakefield recently, aged 71.

MR. JOSEPH ARTHUR EDWARD MITCHELL, engineer's patternmaker, of Keighley, died recently, aged 78. He had a long connection with Keighley Association of Engineers.

MR. ALFRED LITTLEY, chairman of Rudge Littley, Limited, iron and non-ferrous founders, of West Bromwich, died on January 14 after a long illness. He was in his 78th year.

GEN. THE HON. SIR HERBERT LAWRENCE, who died on Sunday, aged 81, after a short illness, was distinguished both as a soldier and a businessman. He was formerly chairman of Vickers, Limited, and a director of the L.M.S. Railway.

MR. ALFRED HENRY BARNARD died at Torquay recently, at the age of 72. A member of the firm of H. B. Barnard & Sons, Limited, metal merchants and manufacturers, he retired from active participation in the business some years ago owing to ill-health. He was for many years a prominent figure on the London Metal Exchange.

LT.-COL. J. H. LESLIE died in London recently, aged 84. Col. Leslie served for 20 years in the Royal Artillery, in which he was commissioned in 1877. On leaving the Service with the rank of Major he took charge of the ordnance department at Vickers, Limited, Sheffield, and in 1917 was appointed a special director of the company.

MR. G. L. KIRKPATRICK, managing director of Bruce Peebles & Company, Limited, manufacturing electrical engineers, of Edinburgh, died suddenly on January 9. A son of the late Prof. W. T. Kirkpatrick, of Queen's College, Belfast, Mr. Kirkpatrick was articled on leaving school with Browett, Lindley & Company, Limited, of Manchester, and afterwards had experience with various electrical engineering firms. At the end of the last war he joined the British branch of the Swedish General Electric Company, Limited. He was appointed general manager of Bruce Peebles & Company, Limited, in 1932, and managing director in 1934.

PRIOR TO ITS MEETING at Bristol last Saturday, members of the General Council of the Institute of British Foundrymen, together with members of the newly-formed Bristol and West of England Branch, visited, by courtesy of the directors, the foundries of Aero Engines, Limited. The party was entertained at luncheon in the staff canteen. In the early evening, Mr. J. F. Gist presented a Paper on "Electric Steel and Its Relation to making Cast Steel Cables" to a joint meeting of the Council and the local Branch.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Engineers (B. N. Taylor), 65, High Street, Edgware, Middlesex—£5,000. B. N., C., B. K., and D. C. Taylor.

Park Engineering Company (Bardsley), Oldham Road, Bardsley, Ashton-under-Lyne—£2,500. H. Haslam and B. M. Scammell.

Stewart's Castings, 72, Hillview Road, Sutton, Surrey—Founders, engineers, etc. £1,000. W., R., and R. S. Stewart, and R. R. Faichnie.

Joseph Calderbank, 37, Birch Street, Wigan—Machinery and metal merchants. £4,000. C. M., J. F., J., J. A., W. G., A., and M. Calderbank.

L. Shelley, 116A, Villa Road, Handsworth, Birmingham—Tool makers, ironfounders, engineers, etc. £2,500. J. Horton and R. L. Waldron.

R. & H. (Nottingham)—To take over the business of manufacturers of heavy switchgear electrical apparatus carried on as "John Berry," at Popham Street Works, Nottingham. £7,000. J. G. and K. G. Berry.

CONTRACTS OPEN

The date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Bootle, January 30—Iron castings, tools, bolts, nails, rivets, etc., for six or 12 months from April 1, for the Corporation. Mr. W. A. Harrison, borough engineer and surveyor, Town Hall, Bootle, Yorks.

Caernarvon, February 20—Iron castings, etc., during the year ending March 31, 1944, for the County Council. The County Surveyor, County Offices, Caernarvon.

Selby, February 15—Cast-iron grates and frames for the year ending March 31, 1944, for the Rural District Council. Mr. Richard F. Braithwaite, 22, Park Street, Selby, Yorks.

COMPANY NEWS

(Figures for previous year in brackets.)

Foster, Yates & Thom—Dividend of 6% (5%).

Greenwood & Batley—Interim dividend of 5% (same).

E. G. Brown & Company—Profit for the year to September 30, 1942, £223,595 (£283,895); income-tax and E.P.T., £205,000 (£265,000); to general reserve, £2,000 (£2,089); ordinary dividend of 25% (same); forward, £13,331 (£11,986).

THE ANNUAL MEETING of the American Foundrymen's Association will be held in St. Louis on April 28, 29 and 30. It will be a mobilisation of management, technical and operating men for the purpose of devising ways and means for extending the use of cast metals in the war effort.

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G.P.159

NEWS IN BRIEF

EMPLOYEES OF THE Grahamston Iron Company, Limited, Falkirk, subscribed £357 to the Red Cross, ambulance motor convoy fund, etc., during the year 1942.

SHOWER BATHS have been installed at the works of Samuel Russell & Company, Limited, ironfounders, Walsall, and were formally opened on Saturday by Sir George Schuster, M.P.

THE NOMINAL CAPITAL of the Glanmorfa Foundry & Engineering Company, Limited, Llanelly, has been increased by £55,000 in 55,000 7 per cent. cumulative redeemable preference shares of £1 each to £155,000.

EMPLOYEES OF Shanks & Company, Limited, sanitary engineers and ironfounders, Barrhead, Glasgow, contributed £525 to hospitals during 1942. Additional benevolent contributions, including £593 for employees serving with the Forces, make a total of £1,374 for the year.

THE COMPANIES REGISTRATION OFFICE gives notice that the names of the undermentioned companies have been struck off the register, and such companies are dissolved:—Hackford Combustion, Limited; Rapid Electric Arc Welding & Metals Company, Limited; Simplifix Steel Couplings, Limited.

A SURVEY is being undertaken in Darlington by the Nuffield College Reconstruction Survey on behalf of the Board of Trade in connection with a plan for the location of industries after the war to prevent widespread unemployment. The survey is being carried out by Messrs. H. E. R. Highton and E. Allen, of King's College, Newcastle-upon-Tyne.

MR. GEORGE HICKS, Joint Parliamentary Secretary to the Ministry of Works and Planning, said that where licences had been granted for building and civil engineering work it had been possible to secure a saving of 25 per cent. in the steel originally asked for, 30 per cent. in cast iron, and 25 per cent. in timber by requiring the use of alternative materials.

INTIMATION OF THE willingness of the Amalgamated Engineering Union to propose the amalgamation of some, or all, of the unions in the engineering, ironfounding, and vehicle building industries is given in the official journal of the A.E.U., which states that "given the requisite degree of genuine goodwill and sincere intention the A.E.U. is prepared to take the initiative."

TWO EXAMPLES of foundry workers holding long-service records have recently been brought to our attention. Mr. W. Hillyard, of Leeds, is still engaged on the moulding of locomotive cylinders, although he will attain the age of 79 in April next, and is working a 10-hr. day. In 1885 Mr. Hillyard founded the Friendly Society of Ironfounders, now incorporated in the National Union of Foundry Workers, and his membership has been unbroken for close on 58 years. Mr. Cyrus Midgley, of Keighley, is another long-service moulder, having spent some fifty years in that occupation. Now, at the age of 76, he is the oldest employee of Dean, Smith & Grace, Limited, lathe manufacturers and ironfounders, of Keighley, Yorks.

PERSONAL

MR. EDWARD PRITTY has resigned from the board of the Glacier Metal Company, Limited. Mr. W. H. Tait, research engineer, has been appointed a director to fill the vacancy.

MR. T. T. PEARSON retired from the management of the Fitzroy Works, London, of Fredk. Braby & Company, Limited, on December 31. He had been with the company for 49 years.

MR. S. C. GOODWIN, chairman of the Neepsend Steel & Tool Corporation, Limited, Sheffield, has become chairman of Jonathan Hattersley & Sons, Limited, textile engineers and ironfounders, Leeds.

MR. L. K. BRINDLEY, a director and manager of Brandeis, Goldschmidt & Company, Limited, metal merchants, London, has accepted the invitation of the Falconbridge Nickel Mines, Limited, of Toronto, Canada, to become vice-president of that company.

MR. E. G. MORT, general manager of the firm's Briton Ferry Works; Mr. J. S. Bradshaw, of the scrap iron and steel department, and Mr. F. W. Robinson, of the foundry supplies department, have been appointed local directors of Thos. W. Ward, Limited, Sheffield. Each has been associated with the company for over 20 years.

MR. J. H. MARSDIN, who had served the firm of John Bedford & Sons, Limited, steel and tool makers, Sheffield, for 64 years, and for many years was manager of their file department, was the guest of honour at a luncheon given by the company last week. Mr. Marsden is 80 years of age and is now living in retirement.

MR. FELIX L. LEVY, who is on the board of George Cohen, Sons & Company, Limited, and of T. C. Jones & Company, Limited, has been appointed a director of Kryn & Lahy (1928), Limited, engineers and steelfounders, of Letchworth, Herts. He is at present seconded to the Ministry of Supply as Assistant Director of Scrap Supplies.

SIR GEORGE NELSON has been nominated president-elect of the Federation of British Industries for the ensuing year. Sir George Nelson's knighthood, for services rendered to the Ministry of Aircraft Production and the Ministry of Supply, was announced in the recent New Year Honour's list. He is chairman and managing director of the English Electric Company, Limited.

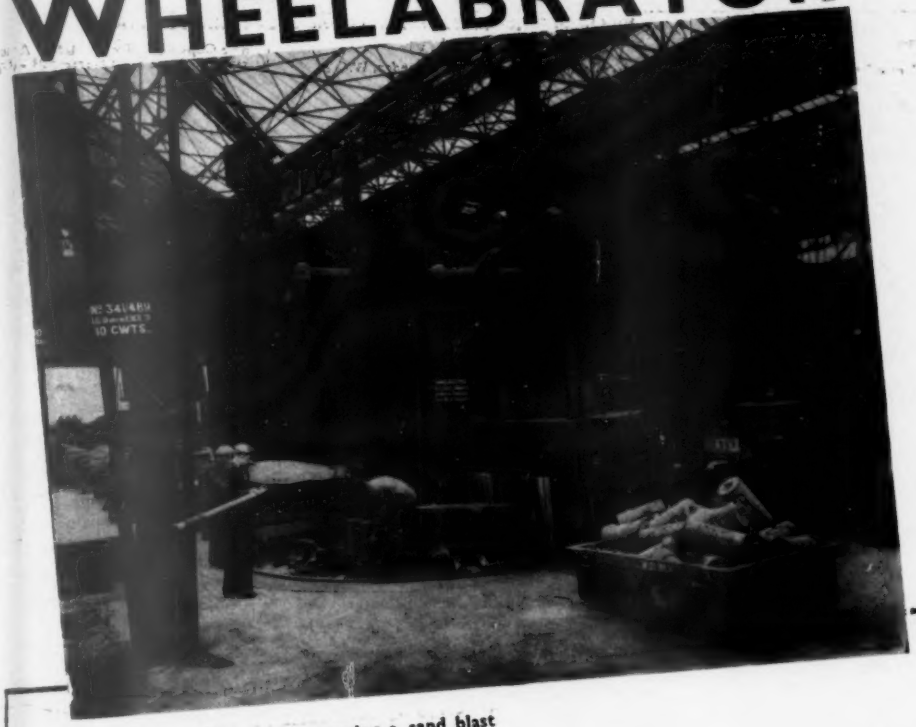
SIR JOHN E. THORNYCROFT, managing director of John I. Thornycroft & Company, Limited, shipbuilders and engineers, has now become governing director and chairman. Mr. T. Donaldson, Mr. J. Maughfling, and Lt.-Comdr. J. W. Thornycroft, directors, are appointed joint managing directors. Mr. J. Maughfling retires from the secretaryship, and Mr. A. H. Musto is appointed secretary in his place.

Wills

PROUDLOCK, M. R., chairman and managing director of the Redheugh Iron & Steel Company (1936), Limited, and other concerns £84,139

COCKBURN, NORMAN, Edinburgh, a former director of Allied Ironfounders, Limited, formerly chairman and managing director of M. Cockburn & Company, Limited, Falkirk £60,014

WHEELABRATOR



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